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10/815,336	04/01/2004	James Z. Liu	H0006268-0769	7533

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EXAMINER	
TURK, NEIL N	

ART UNIT	PAPER NUMBER
1743	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/815,336	LIU, JAMES Z.	
	Examiner	Art Unit	
	Neil Turk	1743	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE ____ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☒ Claim(s) *13 and 14* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/1/04, 8/8/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

Claims 13 and 14 are objected to because of the following informalities: It appears applicant has switched the two different groups of material listings between claim 13 and 14. Claim 13 is drawn to alloys, but lists what Applicant calls "metals-nonmental compounds". Claim 14 recites metal-nonmetal compounds, but recites alloys. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 8 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear what additional structure and control is required in order to perform the given function. Applicant must establish the specific control that is required for producing vibrations to shake away the analytes from the bonding surfaces. Futhermore, the bonding surfaces lack antecedent basis in the claims and Applicant has not positively recited the analytes being bound to any such surfaces. As currently recited, a sensor with the same structure required by the preceding claims will be taken to have the capability of producing vibrations as recited in claim 8.

Claims 11, 17, and 20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear what type of vibration is being recited given the functional limitations of the claim. What type of vibrations does the dual mode acoustic wave sensor have to produce in order to provide for breaking down bonding connections between analyzer and the plurality of sensing components? What additional structure is involved in the respective devices for producing such vibrations? What kind of bonding is being broken? As currently recited a multiple mode/dual mode/ multi-mode SAW acoustic wave sensor with the same structural limitations as required in claims 1,15, and 19, respectively, will be taken to be capable of producing such vibrations.

Further, in claim 20, what additional structure is provided in the humidity sensor that provides for the shaking away of water droplets?

Claims 10 and 20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear what further structure is required in order for the multiple mode SAW sensor to be a humidity sensor. What further structure allows for the recited "...to shake away any water droplets condensing upon said SAW sensor, thereby permitting said SAW sensor to recover quickly from water saturation". Claims 10 and 20 contain purely functional language but do not establish any further limiting structural elements that would provide for such a specific type of SAW sensor.

Claims 13 and 14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 13 recites that the electrode material is chosen from a group of alloys, however the materials that follow are not alloys. Claim 14 recites that the electrode materials comprise metal-nonmetal compounds, however the materials listed are alloys. It appears Applicant has mistakenly switched the two sets of materials. Examiner will read claim 13 to comprise at least one of the following metal-nonmetal compounds, and claim 14 to read at least one of the following alloys. Examiner also notes that the "2" in "CoSi2" should be sub-scripted to remove any indefiniteness and to properly recite the material.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 11 and 15-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Vig et al. (*Chemical Sensor Based on Quartz Microresonators; June 1996*), hereafter Vig.

Vig discloses a chemical sensor that consists of an array of quartz microresonators. Vig discloses that a microresonator can act as a quartz crystal

microbalance and as a calorimeter, simultaneously, because quartz resonators can be highly sensitive to both mass and temperature changes. Vig further discloses that by applying a variety of thin-film adsorbers to the different resonators in an array and observing the pattern of frequency changes due to an unknown that is admitted into the resonator array enclosure, one can detect and identify chemical and biological agents (abstract; page 138, right-hand column item II).. Vig also discloses that dual-mode SC-cut resonators have been developed for high-stability low-power oscillators. Vig discloses that such resonators allow two well-behaved temperature-compensated modes to be excited simultaneously such that the beat frequency between the two modes is a steep and monotonic function of temperature. Vig further discloses that dual-mode microresonators may be useful as chemical sensors, such that one of the temperature insensitive modes can be used for sensing the mass loading, while the beat frequency is used a temperature sensor (page 139, left-hand column, first two paragraphs).

Claims 1, 2, 9, 11, and 15-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Kim (6,293,136).

Kim discloses a multiple mode operated surface acoustic wave sensor. Kim discloses that the modes are a combination of a temperature effect and a measurand effect. Kim discloses that the measurand effect is caused by the absorption and/or adsorption of a substance into a selective coating on the piezoelectric substrate. Kim discloses that the temperature effect is effectively eliminated by simultaneously solving equations representative of the different modes of operation. Kim further discloses that

the sensor can be used to detect different chemicals or substances (abstract; lines 60-67, col. 3;). Kim shows in figure 1 a SAW sensor 10 having a delay line configuration, the SAW sensor comprises a piezoelectric material 12 on which are placed input interdigital electrodes 14 and output interdigital electrodes 16 (converting electrical energy into a surface acoustic wave). Kim discloses that depending on the crystal cut, the SAW device can be operated with the combination of a SAW, leaky surface acoustic wave (LSAW) or pseudo surface acoustic wave (PSAW), and harmonic modes from a single device layout (lines 1-27, col. 3, fig. 1). Kim also discloses an example in which both surface acoustic waves and leaky surface acoustic waves exist in a thirty-sixty degree rotated Y-cut of lithium tantalite, and also possible piezoelectric materials including lithium niobate (lines 17-25, col. 3). Kim further discloses that the present invention may be utilized in an array of sensors that have multiple coatings which may be utilized to increase the selectivity. For example, an array of SAW sensors may be fabricated on a planar surface with selective coatings associated with each separate SAW device in the array (lines 20-48, col. 4). Kim further shows in figure 6 a block diagram that represents an overview of the system and the signal processing (lines 7-26, col. 5, fig. 6).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 9 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vig in view of Korsah et al. (6,044,332), hereafter Korsah.

Vig has been discussed above.

Vig does not disclose that the acoustic wave sensor is a SAW sensor.

Korsah discloses a multiple mode sensing system (harmonic modes) comprising a surface acoustic wave sensor (SAW) (abstract; lines 13-67, col. 2).

It would have been obvious to modify the Vig device to utilize the multi-mode SAW sensor taught by Korsah as a known alternative transducer for use in a multiple mode sensing system.

Claims 9 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vig in view of Kim (6,293,136).

Vig has been discussed above.

Vig does not disclose that the acoustic wave sensor is a SAW sensor.

Kim has been discussed above.

It would have been obvious to modify the Vig device to utilize the multi-mode SAW sensor taught by Kim as a known alternative transducer for use in a multiple mode sensing system.

Claims 3-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view of Ebersole et al. (5,135,852), hereafter Ebersole.

Kim has been discussed above.

Kim does not disclose FMP data, acoustic plate mode data, or SH-APM data.

Ebersole discloses that SAW devices represent an alternative piezoelectric transduction technique. Ebersole further discloses that flexural plate-mode devices represent another alternative technology capable of measuring mass changes at the surface of a piezoelectric substrate (lines 53-67, col. 6).

It would have been obvious to modify the Kim device to include a flexural plate-mode device for providing frequency outputs of FMP data such as taught by Ebersole in order to provide a known alternative device for producing data so as to measure changes at the surface of a piezoelectric substrate.

Claims 10 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view Kuisama et al. (4,378,168).

Kim has been discussed above.

Kim does not disclose that SAW sensor comprises a humidity sensor.

Kuisama discloses a SAW sensor for determining relative humidity (abstract, lines 27-67, col. 1; line 65, col. 3 – line 8, col. 4; fig. 1).

It would have been obvious to modify the Kim device to have a SAW sensor comprising a humidity sensor such as taught by Kuisama in order to provide a known variant of a SAW sensor to determine relative humidity.

Claims 10 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vig in view of Kim as applied to claims 9 and 19 above, and further in view of Kuisama.

Vig in view of Kim does not disclose that SAW sensor comprises a humidity sensor.

Kuisama has been discussed above.

It would have been obvious to modify the Vig/Kim device to have a SAW sensor comprising a humidity sensor such as taught by Kuisama in order to provide a known variant of a SAW sensor to determine relative humidity.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view of Dreifus et al. (5,838,089), hereafter Dreifus.

Kim has been discussed above.

Kim does not specifically disclose that the sensing components comprise electrode materials chosen from among the group comprising at least one of Al, Pt, Au, Rh, Ir, Cu, Ti, W, Cr, and Ni.

Dreifus discloses acoustic wave devices that include a substrate, a diamond layer on the substrate, an interdigitated transducer structure, and an interlayer contacting the diamond layer and the transducer structure and a piezoelectric layer formed on the interlayer. Dreifus discloses that interdigitated electrodes are formed by deposition of aluminum onto the diamond layer (abstract, lines 7-51, col. 6).

It would have been obvious to modify the Kim device to include an aluminum material for the interdigitated transducer electrodes such as taught by Dreifus in order to provide a known conductive metal material for use in a surface acoustic wave device.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view of Josse et al. (5,852,229)

Kim has been discussed above.

Kim does not specifically disclose that the sensing components comprise electrode materials chosen from among the group comprising at least one of Al, Pt, Au, Rh, Ir, Cu, Ti, W, Cr, and Ni.

Josse discloses a piezoelectric resonator chemical sensing device in which the electrode can be a conductive substance such as silver and aluminum.

It would have been obvious to modify the Kim device to include an aluminum or silver material for the electrodes such as taught by Josse in order to provide a known conductive metal material for use in a surface acoustic wave device.

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view of Desu et al. (5,527,567).

Kim has been discussed above.

Kim does not specifically disclose that the sensing components comprise electrode materials chosen from among the group comprising at least one of TiN, CoSi2, and WC.

Desu discloses high quality layered structure oxide ferroelectric thin films which are useful in the applications of piezoelectric transducers and surface acoustic wave devices (lines 33-43, col. 4). Desu discloses that a thin bottom layer electrode is deposited on top of the substrate, and may be a conductive nitride such as TiN (lines 10-27, col. 6).

It would have been obvious to modify the Kim device to include TiN as the electrode material such as taught by Desu in order to provide a known electrode material, in the form of a conductive nitride, on the surface of a substrate for use in a surface acoustic wave device.

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view of Ueda et al. (6,037,847), hereafter Ueda.

Kim has been discussed above.

Kim does not specifically disclose that the sensing components comprise electrode materials chosen from among NiCr and CuAl.

Ueda discloses a surface acoustic wave device in which an interdigital electrode of an AlCu alloy is used with an Y-X cut of a $LiTaO_3$ (abstract; lines 7-17, col. 2).

It would have been obvious to modify the Kim device to include an AlCu alloy material for the interdigital electrode such as taught by Ueda in order to provide Kim with a known electrode material for a SAW device (for both surface and leaky surface acoustic waves) with a lithium tantalite piezoelectric material being used.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vig in view of Josse et al. (5,852,229)

Vig has been discussed above.

Vig does not specifically disclose that the sensing components comprise electrode materials chosen from among the group comprising at least one of Al, Pt, Au, Rh, Ir, Cu, Ti, W, Cr, and Ni.

Josse discloses a piezoelectric resonator chemical sensing device in which the electrode can be a conductive substance such as silver and aluminum.

It would have been obvious to modify the Vig device to include an aluminum or silver material for the electrodes such as taught by Josse in order to provide a known conductive metal material for use in a surface acoustic wave device.

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vig in view of Desu et al. (5,527,567).

Vig has been discussed above.

Vig does not specifically disclose that the sensing components comprise electrode materials chosen from among the group comprising at least one of TiN, CoSi2, and WC.

Desu discloses high quality layered structure oxide ferroelectric thin films which are useful in the applications of piezoelectric transducers and surface acoustic wave devices (lines 33-43, col. 4). Desu discloses that a thin bottom layer electrode is deposited on top of the substrate, and may be a conductive nitride such as TiN (lines 10-27, col. 6).

It would have been obvious to modify the Vig device to include TiN as the electrode material such as taught by Desu in order to provide a known electrode material, in the form of a conductive nitride, on the surface of a substrate for use in a surface acoustic wave device.

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vig in view of Ueda et al. (6,037,847), hereafter Ueda.

Vig has been discussed above.

Vig does not specifically disclose that the sensing components comprise electrode materials chosen from among NiCr and CuAl.

Ueda discloses a surface acoustic wave device in which an interdigital electrode of an AlCu alloy is used with an Y-X cut of a $LiTaO_3$ (abstract; lines 7-17, col. 2).

It would have been obvious to modify the Vig device to include an AlCu alloy material for the interdigital electrode such as taught by Ueda in order to provide Vig with a known electrode material for a SAW device (for both surface and leaky surface acoustic waves) with a lithium tantalite piezoelectric material being used.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Neil Turk whose telephone number is 571-272-8914. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill Warden can be reached on 571-272-1267. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

NT

BRIAN R. GORDON
PRIMARY EXAMINER